

# COASTAL CONNECTIONS



VOLUME 2, ISSUE 5

A BIMONTHLY PUBLICATION FOCUSED ON TOOLS FOR COASTAL RESOURCE MANAGERS

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## COASTAL MANAGEMENT PROFILE



**Carol Bernthal**  
Superintendent, Olympic Coast  
National Marine Sanctuary  
[Carol.Bernthal@noaa.gov](mailto:Carol.Bernthal@noaa.gov)

**Hometown:** Racine,  
Wisconsin

**Education:** Bachelor of  
science in the biological  
aspects of conservation, minor  
in environmental science,  
University of Wisconsin–  
Madison

**Most fulfilling aspect  
of your job:** Protecting an  
amazing coast, working with  
the community to do so, and  
making the concept of a marine  
sanctuary come alive for people.

**Most challenging aspect  
of your job:** Finding enough  
hours in the day to really do the  
job the way I'd like to.

**One work-related  
accomplishment you're  
proud of:** Recent completion  
of the Olympic Coast Discovery  
Center, the first of its type on  
the Olympic Peninsula.

**One personal  
accomplishment you're  
proud of:** Rafting the  
Colorado River last year on

*Continued on Page 2*

## THIS ISSUE'S FOCUS

### IMPERVIOUS SURFACES

Coastal managers know that development adds more concrete, asphalt, roofing, and other impervious surfaces to an area. They also know that these surfaces have negative effects on a watershed. But impervious surfaces are an inevitable result of development, and people have become accustomed to them in their daily lives. So what's a watershed planner to do to balance delicate hydrologic processes with growing urbanization?

#### Calculate the Concrete

One of the problems many coastal and watershed managers face in working to sustain a watershed is a lack of understanding among local officials, developers, and citizens about the relationships between development and natural processes. Each of these groups has different agendas, priorities, and rationales for making decisions, so it is no wonder that the big picture is rarely—if ever—clear.

One way to help get everyone on the same planning page is to demonstrate the causes and effects of just one component of development, and impervious surfaces serve as a good example. Calculating the amount of impervious surface in an area can demonstrate a number of factors for decision makers to consider, including

- How much of the area is already covered. Because they're so accustomed to it, some people may have no real feel for how much asphalt and concrete cover their area. Presenting some hard numbers of the amounts can set the baseline for talks about adding more.
- How the current amount of impervious surface affects environmental conditions. If a town has noticed the bank of a stream eroding and the impervious surfaces there have increased significantly over the years, development is probably affecting the stream bank. If the land cover hasn't changed in that area, other factors may be in play and should be investigated.
- How current development practices will affect future water quality. By projecting the course of development under current codes and regulations, planners can speculate how much impervious surface will cover an area in the future. Decision makers can then use that information to estimate what kinds of environmental effects the increased imperviousness could have.

#### Put It to Practice

Once you've determined how much of your area is covered in impervious surfaces, you can use that information to start making some decisions. In Duluth, Minnesota, for example, city planners have been using imperviousness calculations to help guide the city's new comprehensive plan and to prioritize land for conservation.

*Continued on Page 2*

a private trip with a group of friends for 21 days.

**Things you do in your spare time:** Anything outdoors, including technical mountain climbing, telemark skiing, and ocean rowing. Also reading, watching offbeat movies, and knitting.  
**Family:** Married, one cat, four brothers, and two parents  
**Favorite movie:** Current favorite is *Fahrenheit 9/11*  
**In your CD player right now:** The Ecclestones (Celtic rock band from Victoria)

Carol Bernthal is all about connections. While in college, Carol studied the connections between science, conservation, and policy, noting she was particularly interested in “the application of knowledge to management.”

Now, as manager of the Olympic Coast National Marine Sanctuary, Carol has been working to connect the public with the sanctuary and the resources of the Olympic Coast. “The sanctuary has been a hard concept to convey to people,” Carol notes. But the newly opened Olympic Coast Discovery Center is helping to explain the area, engaging the public with interactive kiosks, information stations, and a “submersible theater” that shows people what it’s like to be on the ocean floor.

Carol also regularly connects herself with nature. She served as a park ranger with the Young Adult Conservation Corps in college and now does everything from biking to mountain climbing.

When she’s not busy in the great outdoors, Carol lives in Port Townsend with her husband, Byron Rot, and her cat, Jesse Ventura.

According to Jesse Schomberg, coordinator of Duluth’s Nonpoint Education for Municipal Officials, or NEMO, program, water quality and impervious surfaces have become an increasingly important issue in the area, where 42 named streams run through the city.

“There are lots of positive things going on in this community to protect the streams,” he notes. “But trout have been wiped out in upper parts where there is more development and the water has gotten too warm.”

To prevent further degradation, the NEMO program gave a number of presentations to city officials on current imperviousness and which areas are at the highest risk. The natural lands remaining in areas with the highest percentage of impervious surface were tagged as the best candidates for conservation as parkland.

City and county officials in Tennessee are also taking a look at how impervious surfaces will affect their future. The Tennessee Growth Readiness program recently took part in a visioning exercise in which imperviousness percentages were calculated for the present, for the year 2020 if development continues using current practices, and for the year 2020 if development is guided by preserving open space, clustering development, and creating walkable communities.

As was expected, the differences between the scenarios were quite remarkable. “It is a very powerful example of how our development choices might change our landscape,” explains Joel Haden, sustainable development project manager with the program. “We use it not as doom and gloom but as a way into a conversation about what we can do about it. It’s a way of introducing people to the changes they can make.”

In less than a year, Tennessee’s program has educated over 260 communities, several of which have already made changes in their codes and ordinances.

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## Tools You Can Use

### IMPERVIOUS SURFACE ANALYSIS TOOL

In the past, calculating the impervious coverage of an area was a time-consuming and expensive process, since surveyors had to map surface edges by hand in the field. But new technology, such as the Impervious Surface Analysis Tool, or ISAT, now makes this task much easier.

Developed by the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center and the University of Connecticut’s Nonpoint Education for Municipal Officials (NEMO) program, ISAT is a geographic information system software extension that uses the land cover of an area to estimate the area’s overall imperviousness. It works like this:

1. Users acquire the appropriate land cover data and select a geographic area of interest
2. The tool color-codes the area, showing areas of less than 10 percent, 10 to 25 percent, and greater than 25 percent imperviousness
3. The tool creates a table that shows the percent imperviousness for each selected polygon

Users can also simulate land cover changes to see how these changes influence impervious surface coverage. The percent imperviousness is determined by coefficients applied to each land cover class. Population density can also be incorporated into these coefficients. Download ISAT at [www.csc.noaa.gov/isat/](http://www.csc.noaa.gov/isat/). To create coefficients for your area, see Page 3.

## THE NEMO PROGRAM

The University of Connecticut's Nonpoint Education for Municipal Officials, or NEMO, program educates local officials about land use and natural resource protection. With a national network of 28 programs, NEMO provides presentation materials, research, and mapping technologies to local decision makers to help them visualize their current and future landscapes. To learn more about your state's NEMO program, or how to start one, visit <http://nemo.uconn.edu/national/>, or contact David Dickson, the National Network coordinator, at (860) 345-4511.

## WHERE TO FIND DATA

So you want to find out how impervious your area is. How do you start? To use software tools such as ISAT, you'll need land cover data that are organized into accepted development categories. These categories are then translated into levels of imperviousness. If your organization doesn't already have land cover data, some good resources include

- NOAA Coastal Services Center's Coastal Change Analysis Program (C-CAP) data, [www.csc.noaa.gov/landcover/](http://www.csc.noaa.gov/landcover/)
- U.S. Geological Survey's (USGS) National Land Cover Data (NLCD) 2001, <http://landcover.usgs.gov/nationallandcover.asp>
- National Gap Analysis Program, [www.gap.uidaho.edu/Projects/FTP.htm](http://www.gap.uidaho.edu/Projects/FTP.htm)
- Your state's geographic information systems department

USGS and the NOAA Coastal Services Center are also creating percent imperviousness data based on estimates from high-resolution imagery. This process creates a detailed continuous surface in which each pixel shows the percent of constructed surfaces for a 30-meter by 30-meter area. This level of detail makes these data more specific than typical land cover data.

To find out if imperviousness data for your area are available on-line, first check the USGS Web site at [www.mrlc.gov/mrlc2k\\_nlcd.asp](http://www.mrlc.gov/mrlc2k_nlcd.asp). If your data are not yet on the site, the NOAA Coastal Services Center may have data for your state. Contact Nate Herold at the Center at [Nate.Herold@noaa.gov](mailto:Nate.Herold@noaa.gov) to find out if and when the data you are looking for will be available.

## Impervious Surface Analysis CREATE YOUR OWN COEFFICIENTS

To relate different types of land cover to their levels of imperviousness, tools like ISAT use certain values, or coefficients, that represent the imperviousness for each class. These coefficients are percentages that estimate the average amount of impervious coverage in each land cover class. For example, the high-intensity developed class might have an imperviousness coefficient of 59, the low-intensity developed class a coefficient of 41, and forested land a coefficient of 3.

ISAT includes a set of default coefficients that can be used for any analysis, but the analysis of a particular area will be more accurate if coefficients specific to that area are used. Here are some basic guidelines for how to generate your own coefficients.

### 1. Collect Required Data Sets

- Land cover data for sample sites. These sites should be a mixture of rural, suburban, and urban areas.
- Imperviousness data for the area. This generally is in the form of vector data, which may be created by hand-digitizing data from aerial photos. If your agency doesn't have in-house data processors, you may be able to get an imperviousness data layer from your state geographic information systems (GIS) department.
- Population density data. U.S. Census Bureau TIGER files are a common source of population data. Find these data at [www.census.gov/geo/www/tiger/](http://www.census.gov/geo/www/tiger/).

### 2. Prepare Data in a GIS

- Using the tools of your GIS software, choose a common map projection, usually that of the land cover data.
- Determine the spatial extent, usually that of the sample impervious surface data.
- Convert vector layers to grid layers with a common spatial resolution.
- Resample the land cover data to the common spatial resolution (if needed).

### 3. Calculate Coefficients

- Establish population range limits for low-, medium-, and high-density areas.
- Use the statistical analysis function of your GIS program ("zonal stats" in many programs) to calculate the weighted mean and weighted standard deviation of the impervious surface estimates for all combinations of land cover class and population density range. These are your coefficients.

### 4. Save Your Process

If you have GIS programmers on staff, get their help to automate the above process. This way, you can skip several of these steps next time you create coefficients.

*Coastal Connections* is a publication of the National Oceanic and Atmospheric Administration Coastal Services Center, produced for the coastal resource management community. Each issue of this free bimonthly newsletter focuses on a tool, information resource, or methodology of interest to the nation's coastal resource managers.

Please send us your questions and suggestions for future editions. To subscribe or contribute to the newsletter, contact our editors at

*Coastal Connections*  
NOAA Coastal Services Center  
2234 South Hobson Avenue  
Charleston,  
South Carolina 29405  
(843) 740-1200  
[CoastalConnections@noaa.gov](mailto:CoastalConnections@noaa.gov)  
[www.csc.noaa.gov/newsletter/](http://www.csc.noaa.gov/newsletter/)

**Editor:**

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# NEWS AND NOTES



## CREST Symposium Call for Papers

Coastal Restoration and Enhancement through Science and Technology, or CREST, is calling for papers for its April 2005 symposium on coastal land loss and restoration in Louisiana. For more information about paper and poster topics, visit [www.gulfcrest.org](http://www.gulfcrest.org). The deadline for submitting a paper or poster is December 15, 2004.

## Graphical Coastal and Marine Forecasts Available On-Line

NOAA's National Weather Service forecasts are now available graphically on the Web. The forecasts include such information as temperatures, wave height, and wind speed and direction out to seven days in the future. Access these forecasts at <http://weather.gov/forecasts/graphical/>.

## Connecticut Coastal Access Guide

The Connecticut Department of Environmental Protection has launched a new coastal access guide Web site. The site provides descriptions of 285 public access sites on Connecticut's coast. Visit the site at [www.dep.state.ct.us/coastalaccess/](http://www.dep.state.ct.us/coastalaccess/).

## Restoration BMP Web Site in Maryland

Maryland's Department of Natural Resources has created a Web site to track the state's restoration and nonpoint source pollution efforts. Located at <http://dnrweb.dnr.state.md.us/watersheds/surf/bmp/>, the site tracks the success of best management practices (BMPs) for urban areas, farmland, and resource protection and improvements.

## Transitions

**Ted Diers** is now the acting manager of the New Hampshire Coastal Program... **David Keeley** is leaving the Maine State Planning Office... **Tom Skinner** has left the Massachusetts Office of Coastal Zone Management. **Susan Snow-Cotter** is acting director.

## Accolades

**America's Wetland Foundation** won a third place Gulf Guardian Award for its Campaign to Save Coastal Louisiana... The **Olympic Coast National Marine Sanctuary** recently celebrated its 10th anniversary... The **Mississippi Department of Marine Resources** recently received three awards from the Southern Public Relations Federation.

NOAA Coastal Services Center  
2234 South Hobson Avenue  
Charleston, South Carolina 29405

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